REMARKS

This is intended as a full and complete response to the Office Acton dated June 24, 2003, having a shortened statutory period for response set to expire on September 24, 2003. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-30, 31-39, and 42-46 remain pending in the application and are shown above. Claims 31-37 and 40-41 have been canceled by Applicant. Claims 1-9, 19-30, 38-39, 42, 43, 45, and 46 are rejected. Claims 10-18 and 44 are indicated to be allowable by the Examiner. Reconsideration of the rejected claims is requested for reasons presented below.

Claims 1, 2, 19, 20, 42, and 45 are amended to clarify the invention. Claims 44 and 46 are amended to correct matters of form. Applicant submits that the changes made herein do not introduce new matter.

Claims 1-8, 19-29, 38, 39, 42, 43, 45, and 46 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Roberts, et al.* (U.S. Patent No. 6,461,914) in view of *Contolini, et al.* (U.S. Patent No. 5,486,234) or *Nishibe, et al.* (U.S. Patent No. 6,299,697). The Examiner states that *Roberts, et al.* teaches that a metal conductive layer may be planarized by a wet or dry etch process and that *Roberts, et al.* is not particular about the process of wet or dry etching. The Examiner asserts that it therefore would have been obvious to use a conventional wet etching process, dry etching process, or a combination thereof, such as to perform them sequentially.

Applicant submits that the Examiner has provided insufficient evidence that *Roberts, et al.* suggests or motivates a method of planarizing a metal in which both a liquid etching composition and an etchant gas are used. *Roberts, et al.* describes planarizing a metal layer by CMP, etch-back, such as a wet or dry etch process, or the like. *Roberts, et al.* does not provide any motivation to use more than one type of etch process.

Contolini, et al. and *Nishibe, et al.* only describe wet etch processes. *Contolini, et al.* and *Nishibe, et al.* do not describe dry etch processes or planarization method in which a liquid etching composition and an etchant gas are used. Thus, *Roberts, et al.*

alone, or in combination with *Contolini, et al.* or *Nishibe, et al.* does not teach or suggest a planarization method in which a wet etch and a dry etch are used.

Roberts, et al. alone, or in combination with *Contolini, et al.* or *Nishibe, et al.* does not teach, show, or suggest a method of planarizing a metal conductive layer on a top surface of a substrate, comprising placing the substrate on a rotable substrate support, rotating the substrate support, contacting the top surface of the substrate with a liquid etching composition while the substrate support is rotating to form an etched metal conductive layer, and exposing the etched metal conductive layer to an etchant gas, as recited in claim 1. Applicant respectfully requests withdrawal of the rejection of claim 1 and of claims 2-8 and 38-39 which depend thereon.

Roberts, et al. alone, or in combination with *Contolini, et al.* or *Nishibe, et al.* does not teach, show, or suggest a method of forming a metal conductive feature on a substrate, comprising placing a substrate on a substrate support, the substrate having a top surface with a material layer on said top surface, and the material layer having at least one opening therethrough, depositing a metal conductive layer having a pre-etch field thickness, wherein the metal conductive layer completely fills the at least one opening, rotating the substrate, while the substrate is rotating, contacting the top surface of the substrate with a liquid etching composition in order to remove portions of a top surface of the metal conductive layer, and exposing the metal conductive layer to an etchant gas, as recited in claim 19. Applicant respectfully requests withdrawal of the rejection of claim 19, and of claims 20-29, which depend thereon.

Roberts, et al. alone, or in combination with *Contolini, et al.* or *Nishibe, et al.* does not teach, show, or suggest a method of forming a copper feature on a substrate, comprising placing a substrate on a substrate support, the substrate having a top surface with a material layer on said top surface, and the material layer having at least one opening therethrough, depositing a copper layer having a pre-etch field thickness, wherein the metal conductive layer completely fills the at least one opening, rotating the substrate, while the substrate is rotating, contacting the top surface of the substrate with a liquid etching composition selected from the group consisting of nitric acid, hydrochloric acid, peroxygen compounds, and combinations thereof, and sprayed onto the substrate in the direction of rotation of the substrate, in order to remove portions of

a top surface of the copper layer, placing the substrate in a plasma etch chamber, and exposing the etched metal conductive layer to an etchant gas, as recited in claim 42. Applicant respectfully requests withdrawal of the rejection of claim 42.

Roberts, et al. alone, or in combination with *Contolini, et al.* or *Nishibe, et al.* does not teach, show, or suggest a method of forming a copper feature on a substrate, comprising placing a substrate on a substrate support, the substrate having a top surface with a material layer on said top surface, and the material layer having at least one opening therethrough, depositing a copper layer having a pre-etch field thickness, wherein the metal conductive layer completely fills the at least one opening, rotating the substrate, and while the substrate is rotating, contacting the top surface of the substrate with a liquid etching composition is selected from the group consisting of nitric acid, hydrochloric acid, peroxygen compounds, and combinations thereof, and is sprayed onto the substrate in the direction of rotation of the substrate in order to remove portions of a top surface of the metal conductive layer, and exposing the etched metal conductive layer to an etchant gas for a period of time sufficient to remove substantially all of the conductive layer from the field of the substrate, and to planarize the top surface of the metal conductive layer, as recited in claim 43. Applicant respectfully requests withdrawal of the rejection of claim 43.

Roberts, et al. alone, or in combination with *Contolini, et al.* or *Nishibe, et al.* does not teach, show, or suggest a method of forming a copper feature on a substrate, comprising placing a substrate on a substrate support, the substrate having a top surface with a material layer on said top surface, and the material layer having at least one opening therethrough, depositing a copper layer having a pre-etch field thickness, wherein the metal conductive layer completely fills the at least one opening, rotating the substrate, while the substrate is rotating, contacting the top surface of the substrate with a liquid etching composition selected from the group consisting of nitric acid, hydrochloric acid, peroxygen compounds, and combinations thereof, and sprayed onto the substrate in the direction of rotation of the substrate, in order to remove portions of a top surface of the copper layer, each of steps (a)-(d) being performed in the same electroplating platform and in the same environment, placing the substrate in a plasma etch chamber, and exposing the etched metal conductive layer to an etchant gas, as

recited in claim 45. Applicant respectfully requests withdrawal of the rejection of claim 45.

Roberts, et al. alone, or in combination with *Contolini, et al.* or *Nishibe, et al.* does not teach, show, or suggest a method of forming a copper feature on a substrate, comprising placing a substrate on a substrate support, the substrate having a top surface with a material layer on said top surface, and the material layer having at least one opening therethrough, depositing a copper layer having a pre-etch field thickness, wherein the metal conductive layer completely fills the at least one opening, rotating the substrate, and while the substrate is rotating, contacting the top surface of the substrate with a liquid etching composition is selected from the group consisting of nitric acid, hydrochloric acid, peroxygen compounds, and combinations thereof, and is sprayed onto the substrate in the direction of rotation of the substrate in order to remove portions of a top surface of the metal conductive layer, and exposing the etched metal conductive layer to an etchant gas for a period of time sufficient to remove substantially all of the conductive layer from the field of the substrate, and to planarize the top surface of the metal conductive layer, each of steps (a)-(d) being performed in the same electroplating platform and in the same environment, as recited in claim 46. Applicant respectfully requests withdrawal of the rejection of claim 46.

Claims 9 and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Roberts, et al.,* in view of *Contolini, et al,* or *Nishibi, et al.* and further in view of *Yamamoto, et al.* (U.S. Patent Application No. US 2002/0037684) or *Lo* (U.S. Patent No. 5,667,630). As discussed above, *Roberts, et al.,* in view of *Contolini, et al,* or *Nishibi, et al.* does not provide a planarization method in which both a liquid etching composition and an etchant gas are used. *Yamamoto, et al.* and *Lo* describe dry etch methods but do not describe a planarization method in which both a liquid etching composition and an etchant gas are used. Thus, *Roberts, et al.,* in view of *Contolini, et al,* or *Nishibi, et al.* and further in view of *Yamamoto, et al.* or *Lo* does not provide all of the limitations of claim 1 and claim 19, upon which claims 9 and 30 respectively depend. Applicant respectfully requests withdrawal of the rejection of claims 9 and 30.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

The secondary references made of record are noted. However, it is believed that the secondary references are no more pertinent to the Applicant's disclosure than the primary references cited in the office action. Therefore, Applicant believes that a detailed discussion of the secondary references is not necessary for a full and complete response to this office action.

Having addressed all issues set out in the office action, Applicant respectfully submits that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,

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